MODULAR CUSHIONED INSOLE SUPPORT SYSTEM

FIELD OF THE INVENTION

The present invention relates to a modular cushioned insole support system that enables a user to construct an insole insert best suited to the user's needs.

BACKGROUND OF THE INVENTION

Athletic footwear has become increasingly sophisticated over the past three decades. In addition to being constructed from advanced materials, a great deal of attention has been paid to proper support for the foot itself. Features such as integral lacing, lateral ankle support, and cushioning systems are all intended to further this objective. Understandably, the primary focus of efforts to properly support and align the foot has been on the structure(s) on which the foot rests within the shoe. Accordingly, whatever support and alignment that has been available has been achieved primarily by the use of integral arch supports and removable insoles, known in the footwear industry as "sockliners" and/or "footbeds. " However, these stock integral arch supports and sockliners rarely, if ever, provide meaningful support for the average foot.

Integral arch supports range in structure and effectiveness from the minimally supportive foamed arch "bubble" commonly found in canvas sneakers to the modestly more supportive arch support structures found in many hiking boots, walking shoes, and the like. Removable sockliners offer a wider variety of structural and support options. Initially created to provide additional thermal insulation for winter boots, sockliners have become more sophisticated. Many athletic shoes now come with single- or multi-stage sockliners in a wide variety of materials, colors, and constructions. Examples of such sockliners range from the heel and forefoot cushions

described in U.S. Pat. Nos. 4,223,457 and 4,227,320, respectively, issued to Borgeas, to more complex structures, such as those described in U.S. Pat. No. 5,771,606 issued to Litchfield *et al.*

Active people that are very concerned with proper foot alignment and support often purchase orthotic insoles that are custom-fitted to the individual by a podiatrist, chiropractor, or other medical provider. However, such custom-made, orthotic insoles are extremely expensive and are not necessary for the vast majority of those who engage in athletics or casual use. Interest in providing greater stability to the foot without the expense of orthotics led to the development of conformable sockliners. Accordingly, there are several known devices that are intended to provide a greater measure of foot alignment than standard sockliners by enabling the user to customize the fit to the user's foot. One such device shown in U.S. Pat. No. 5,203,793 issued to Lyden describes an insertable insole that is partially filled with an impressible substance, such as silicone, such that the insole can conform to the user's foot during use. However, this merely ensures that the insole assumes the conformation of the foot and does not remediate any misalignment that may occur during use.

U.S. Pat. No. 4,510,700 issued to Brown relates to a two-part apparatus combining a more flexible upper sockliner disposed within a more rigid lower cap that further provides a plurality of downwardly extending elastic protuberances frictionally disposed within a like plurality of apertures within the cap. These elastic protuberances are intended to provide a more custom fit for the user. However, in actual practice, the protuberances either travel axially within the apertures or are simply compressed by the weight of the user so that they are flush with the lower surface of the cap, obviating any custom-fitting function that they may have served.

Other efforts at providing a customizable sockliner have been made. U.S. Pat. No. 5,733,647 issued to Moore, III *et al.* describes a device that is intended to be heated and then worn by the user in order for the device to conform to the user's foot. Similarly, U.S. Pat. No. 5,394,626 also issued to Brown provides a more sophisticated insert that also is intended to be heated and conformed to the user's foot. Unfortunately, if the user's foot is not in an optimal position while the conformation is occurring, the user ends up with an insert that very nicely conforms to the misaligned foot.

Unfortunately, extant sockliners do not usually provide the necessary support and proper alignment that the wearer thinks they provide. This discrepancy between promise and performance unfortunately can result in serious foot injuries, including stress fractures, tendonitis, "shin splints," and the like.

What is needed is an easily used, economical, customizable insole that provides substantial support regardless of the user's foot alignment and anatomy. In addition, it is desired to have such an insole that can act to help remediate any misalignment of the foot and to help compensate for maladaptive anatomical structure. It is further desired to have a modular insole support system that can be assembled by the user to maximize the comfort and fit of each shoe independently.

SUMMARY OF THE INVENTION

Accordingly, it is an object of the present invention to provide a modular cushioned insole support system that that promotes substantial foot cushioning and support regardless of the user's foot alignment and anatomy.

It is an additional object of the present invention to provide a modular cushioned insole support system that can be customized by the user such that the system can act to help remediate any misalignment of the foot and to help compensate for maladaptive anatomical structure.

It is a further object of the present invention to provide a modular cushioned insole support system that can be assembled by the user to maximize the comfort and fit of each shoe independently.

A still further object of the present invention is to provide a modular cushioned insole support system that meets the foregoing objects and that is also easy to use and economical.

The present invention relates to a modular cushioned insole support system comprising a plurality of forefoot pieces, each having a dorsally disposed tongue capable of being disposed within a corresponding channel formed in each of a plurality of heel pieces. It is intended that the modular cushioned insole support system of the present invention will comprise a plurality of forefoot pieces and heel pieces. This will enable the user to maximize the comfort, fit, and support characteristics of each shoe individually.

The devices of the present invention may be used in any type of footwear that will accommodate a standard insole, sockliner, or footbed. The universal tongue-and-channel construction of each piece enables selection by the user of the desired combination from the respective pluralities of forefoot and heel pieces and to later adjust the fit of the assembled device.

The forefoot pieces optimally vary in their construction to have certain sizing and differing cushioning effects. Similarly, the heel pieces optimally vary in their construction to

have different alignment, cushioning, and/or anti-pronation effects. Finally, the system of the present invention optionally comprises a heel cup disposed underneath the heel piece such that the heel piece is partially supported by the heel cup.

Numerous other objects, features, and advantages of the present invention will become readily apparent from the following detailed description of the invention taken in conjunction with the claims, and from the accompanying drawings in which like numerals are employed to designate like parts throughout the same.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 shows a plan view of an assembled modular cushioned insole support system of the present invention;

FIGS. 2A-2C shows a side elevation of three embodiments of the forefoot piece of FIG. 1 taken through line A-A';

FIGS. 3A-3C shows a front elevation of three embodiments of the heel piece of FIG. 1 taken through line B-B';

FIG. 4 is an inverted plan view of a heel cup of the present invention disposed relative to a heel piece of the present invention in combination with a forefoot piece of the present invention;

FIG. 5A shows a plan view of another embodiment of the assembled modular cushioned insole support system of the present invention;

FIG. 5B shows a front elevation of one embodiment of the forefoot piece of FIG. 5A taken through line C-C'.

FIG. 6A shows the components of one embodiment of the system of the present invention.

FIG. 6B shows the assembled components of the embodiment of Figure 6A.

FIG. 7A shows a side elevation of one embodiment of the forefoot piece of the present invention.

FIG. 7B shows the forefoot piece of Fig. 7A with a matingly corresponding heel piece.

FIG. 8A shows one embodiment of a heel piece of the system of the present invention having an integral heel cup.

FIG. 8B shows one embodiment of a heel piece of the system of the present invention having an anti-pronation geometry.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

While the modular system of the present invention is susceptible of embodiment in many different forms, there is shown in the drawings and will be described herein in detail, a preferred embodiment of the invention. It should be understood however, that the present disclosure is to be considered an exemplification of the principles of the invention and is not intended to limit the spirit and scope of the invention and/or claims of the embodiments illustrated.

In its simplest form, as shown in FIGS. 1-3A-C and 6A-B, the present invention comprises forefoot piece 10 having an upper surface, a lower surface, and a dorsally disposed tongue 12 capable of fitting within a corresponding channel 22 formed in heel piece 20. It is understood that, for purposes of this detailed description, that forefoot piece 10 and heel piece 20 have each been selected from a plurality of forefoot pieces and heel pieces as may be included in the system of the present invention. FIGS. 2A-2C show one possible plurality of forefoot

pieces 10A-10C and FIGS. 3A-3C show one possible plurality of heel pieces 20A-20C. The universal tongue-and-channel construction of forefoot pieces 10A-10C and heel pieces 20A-20C enables selection by the user of the desired combination from the respective pluralities of forefoot and heel pieces.

It is desired that a releasable, reusable adhesive be interposed between tongue 12 and channel 22 to retain tongue 12 within channel 22 during use. Optionally, an adhesive that will increase the bonding between the forefoot piece 10 and heel piece 20 under the pressure and thermal conditions experienced during use is also contemplated. Additional mechanical fastening means of retaining tongue 12 within channel 22, including various interlock designs such as ribs, pegs, VELCRO™, and other types of corresponding male and female members, such as those shown in FIGS. 7A and 7B, that would provide for a mechanical engagement between the components are also contemplated. It is further contemplated that there may be more than one connection point between tongue 12 and channel 22, such that the effective length of the assembled unit may be increased or decreased without cutting forefoot piece 10.

It is contemplated that the base foams used to manufacture the devices of the present invention include EVA, polyurethane, polyethylene, poron, sorbothane, rubber, elastomers, gels, alone or in any combination. As shown in FIGS. 2A-2C, forefoot piece 10 may be manufactured from laminated layers 12A-12C and 12A'-12C' of material selected to provide various sizing, cushioning, aeration, and durability properties. The hardnesses of the material(s) selected ideally have a durometer reading of 25-50 shore C for each part. The material(s) and the hardness(es) selected will vary depending on the intended application of the device *(e.g.*, cushioning, support, running, walking, golf, skiing, etc.)

The materials selected may also impart properties that render forefoot piece 10 suitable for different climates, *e.g.*, for winter or summer use. It is further contemplated that multiple layers, each imparting different desired properties, may be employed. FIG. 4 shows an embodiment wherein forefoot piece 10 comprises embedded segment 14 composed of materials substantially different from the materials of laminated layers 12A-12C and 12A'-12C'.

The use and/or selection of any traditional footbed features, including, but not limited to, foams, top cloth materials, (such as pig skin, synthetic flocking, or CAMBRELLE™), labels, silk-screening, embossing, and treatment with or incorporation of antimicrobials will not detract from the operation of the invention.

It is also contemplated that embedded segment 14 may comprise gel sacs, air sacs, elastomeric material, spongiform material, and the like, in order to provide additional cushioning of the forefoot during use. It is further contemplated that forefoot piece 10 in general, and embedded segment 14 in particular, may comprise resilient cushioning material capable of deformation in response to compressive forces and reformation when those forces are relieved. It is contemplated that the resilient cushioning material may be disposed such that it defines internal apertures that facilitate its deformation, such as intercises, cells integral in the foamed material, or purposely formed voids. It is still further contemplated that embedded segment 14 comprise a chemical burst-pack that will initiate an exothermic reaction once activated, as for use in winter conditions and activities, such as skiing. Such chemical burst packs may either be integrally provided, requiring the user to replace forefoot piece 10 after each use, or replaceable.

The invention allows for various thicknesses to customize for fit. For example, the thickness of forefoot piece 10 in the region of the toes ranges from 3mm to 6mm. There is also a

thickness range from less than 1mm to 3mm in the heel component under the protruding tongue section of forefoot piece 10. The range of these thicknesses may be increased or decreased depending on the desired result (*i.e.*, to increase or decrease the room in the forefoot, or increase the cushioning in the heel).

As shown in FIGS. 2A and 2B, it is contemplated that forefoot piece 10 may be provided in at least two thicknesses, shown as 2T1 and 2T2, respectively, to enable the user to compensate for differences in size between the left and right feet. *E.g.*, if the user's right foot is one-half size larger than the left, the user would construct the right modular cushioned insole using thinner forefoot piece 10A and the left modular cushioned insole using thicker forefoot piece 10B. Similarly, where the footwear has been provided with a removable insole by the manufacturer, using a forefoot piece that is thinner than that removable insole will enable a person with a foot that is wider than the standard width of the footwear to wear that footwear comfortably. This is particularly useful when the individual's feet are of different widths.

Similarly, it is contemplated that the heel pieces will vary in their construction to have different cushioning and/or anti-pronation or anti-supination effects. As shown in FIGS. 3A, 3C, and 8A, heel pieces 20A and 20C may have differing thicknesses on their medial edges such that the upper surface 24C of heel piece 20C angles more steeply toward the lateral edge thereof than does the upper surface 24A of heel piece 20A, in order to provide and increased degree of anti-pronation support.

Ideally, heel piece 20 will be manufactured from materials that have a flex modulus that minimizes axial and tortional deformation of heel piece 20 and that also have an elastic memory that tends to return heel piece 20 to its original conformation following any such deformation.

As shown in FIGS. 3A and 3B, it is contemplated that the heel piece 20 may be provided in at least two thicknesses, shown as 3T1 and 3T2, respectively, to enable the user to compensate for differences in length between the left and right legs. *E.g.*, if the user's right leg is one-quarter inch longer than the left, the user would construct the right modular cushioned insole using thinner heel piece 20A and the left modular cushioned insole using thicker heel piece 20B to help correct the discrepancy. Typically, such differences in leg length are not the result of physical differences between the lengths of the leg bones, but, rather, are the result of a misalignment of the pelvis. Thus, by varying the thickness of heel piece 20, the user can determine which combination achieves the best result in terms of comfort and function.

As shown in FIG. 4, it is further contemplated that heel piece 20 may define within channel 22 a central aperture 26 disposed in the region of heel piece 20 that underlies the calcaneus. Central aperture 26 is capable of accommodating a corresponding protuberance 16 in tongue 12, such that in use protuberance 16 is disposed within central aperture 26, thereby additionally longitudinally securing the two pieces and further increasing the amount of cushioning provided to the calcaneus.

In a still further embodiment shown in FIGS. 4 and 8B, the present invention comprises heel cup 30 disposed underneath heel piece 20 such that the heel piece 20 is partially supported by heel cup 30. It is contemplated that heel cup 30 will extend substantially across the width of heel piece 20 at the distal end thereof and taper to a narrower width toward the proximal end of heel piece 20, such that the medial portion of heel piece 20 is supported by heel cup 30. Where, as in FIG. 4, heel piece 20 defines central aperture 26, it is contemplated that heel cup 30 may be constructed so as to not underlie central aperture 26 in order to minimize interference with the

increased calcaneal cushioning provided by that embodiment. Where, as in FIG. 8B, arch support is of greater importance than heel cushioning, heel cup 30 may be modified to satisfy this function. Similarly, where both arch support and heel cushioning are desired, a combined structure is contemplated.

Heel cup 30 is preferably heat-molded with heel piece 20 such that the two structures are thermally fused as a unit. Optionally, use an adhesive or other means of engagement between heel cup 30 and heel piece 20 is also contemplated. A still further contemplated means is to employ a second-density, direct-molded heel piece 20 having a region of increased density that functions as heel cup 30, such that the region achieves the objects, function, and results of heel cup 30. It is contemplated that the material selected for heel cup 30 will have durometer range from 50-75 shore C.

In yet another embodiment shown in FIGS. 5A-B, forefoot piece has a width and thickness such that it may be employed to enable a person with a narrow foot to wear a shoe having a width greater than the width of the foot. This embodiment is particularly useful to organizations that must equip a large number of personnel, as it enables the organization to purchase the majority of its footwear in one standard width (*e.g.*, "D") and enable the wearer to adjust the fit of the footwear most comfortably. This will greatly reduce the organization's need to maintain an inventory of footwear in every width for every size, thereby reducing the total number of pairs of footwear that must be purchased. The cost-savings to a large organization such as a national military are significant, as the cost of the device of the present invention is significantly less than the cost of the footwear itself.

It is contemplated in this embodiment that forefoot piece 10 may be molded so as to provide centrally disposed foot accommodation means 18, such that forefoot piece 10 has a first thickness 5T1 disposed about foot accommodation means 18 and a second thickness 5T2 in the region of foot accommodation means 18. It is further contemplated that the transition zone between the perimeter of forefoot piece 10 and foot accommodation means 18 be relatively abrupt to prevent side-slippage of the foot during use of the present invention in a conventional footwear item, yet having a tapered transition between first thickness 5T1 and second thickness 5T2, such that the foot is cradled within foot accommodation means 18.

All or a selection of the various parts described above may be provided as a packaged kit, enabling the user to have the option of doing the custom fitting. Simple instructions would accompany the package so that it would be easy to understand what each of the components was and how to interchange them. The interlocking tongue-and-channel design allows for ease in assembling a wide-ranging combination of heel and forefoot components, without the risk of having the parts being assembled incorrectly. This design also enables the user to further customize the fit if, after use of the devices, it becomes apparent that adjustment is necessary.

Additionally, the user is not confined to one assembly. Because there are multiple components in a package, the user could use one combination, such as a standard forefoot component and support heel component, due to increased pronation when running and switch to a roomy forefoot component and standard heel component to enable wearing heavier socks when walking and pronation isn't a problem.

The various parts optionally may be color-coded to match pictures in the instructions and to further identify each component. Once, the footbed was assembled, it would always look the

same when looking inside the shoe, as you would only see the top cloth (or like surface material or treatment), which covers the foam and would not be color coded. Further, although the heel top cloth may be a different color and material than the forefoot top cloth, the combination of heel and forefoot piece top cloths would always match as a pair.

The devices of the present invention may be provided by footwear manufacturers as a packaged kit with their shoes or sold as an aftermarket product directly to the user. It is also contemplated that the packaged kit may be provided through specialty retail shops, such as running specialty or ski specialty shops, where a retailer with specialized expertise could assist the customer in selecting the right combination heel and forefoot to best fit them and their intended activity.

It will now be apparent to those skilled in the art that other embodiments, improvements, details and uses can be made consistent with the letter and spirit of the foregoing disclosure and within the scope of this patent, which is limited only by the following claims, construed in accordance with the patent law, including the doctrine of equivalents.